

division, and continued to see it during the seven months of the planet's apparition, on every night he looked, except one or two of bad definitions; with powers varying from 170 to 370. It was seen too, moreover, through more than half the circumference of the ring, and with abundant certainty to admit of micrometer measurement.

This certainly appears the most satisfactory account we have ever had of the fine division, especially as the rings are not yet at their maximum inclination; and while it indicates that the notion of the variable breadth of the separation may have been too freely drawn upon, it certainly proves Lerebours' object-glass to give much better definition than Mr. Lassell's speculum, and probably better than Mr. Dawes' Munich object-glass, unless a very wide margin be left for the effect of the different altitudes of the planet at the two places.

Amongst many other features in the appearance of the planet, mentioned by Mr. Jacob, are the transparency of the dark ring, and its brown colour by the transmitted light of the planet, which are both mentioned in a letter, dated Madras, Oct. 10, 1852, and referring to the appearance of the planet on Sept. 22, 1852. He also mentions a suspicion of a sort of scalloping, like the fold of a curtain, on the inner ansæ of the dark ring, and finds the principal division of the bright ring to be filled with a half-luminous medium, and shaded off so much on one edge as to make the accurate measure of its breadth very doubtful.

There can, however, be no doubt of the glasses of the telescope being very transparent, as well as defining well.

Mr. Jacob having lately commenced the regular observation of a selection of double stars, with a view to parallax, though with little hope of success; inasmuch as though this was the final object in view, for which they were taken up by Sir W. Herschel and other observers, no one has yet succeeded in finding the desired quantity. Mr. Jacob was, therefore, unexpectedly pleased at finding, towards the end of last year, that the components of α *Herculis* showed evident symptoms of parallax.

[Professor Smyth then gives the details of Mr. Jacob's observations, which, being similar to those mentioned at page 242, need not be repeated here. He concludes his paper by stating that, as the components of α *Herculis* form one of the most remarkable pairs in the sky for contrasted colours, they may thereby serve to indicate the colour of the medium pervading space.]

On the Corrections to be applied to Burckhardt's and Plana's Parallax of the Moon, expressed in terms of the Mean Arguments. By J. C. Adams, Esq., M.A.

In the Supplement to the *Nautical Almanac* for 1856, I have given new tables of the moon's parallax, adapted to Burckhardt's

form of the arguments. When the arguments have been already computed, these tables supply the most convenient means of finding the parallax, and they have, accordingly, been used in calculating the corrections to the *Nautical Almanac* Parallaxes since 1840, given in the paper above referred to.

When, however, Burckhardt's arguments are not previously known, it will be more simple to employ arguments increasing proportionably to the time, in order to calculate either the parallax itself immediately, or the correction to be applied to that found from Burckhardt's tables.

The following formulæ may be used for this purpose, the arguments being expressed in Damoiseau's notation.

The moon's equatoreal horizontal parallax, or, more strictly, the *sine* of that quantity converted into seconds of arc is equal to

$$\begin{aligned}
 & 3422''.32 + 186.51 \cos x + 10''.17 \cos 2x + 0''.63 \cos 3x + 0''.04 \cos 4x \\
 & - 0''.95 \cos t + 28''.23 \cos 2t + 0''.26 \cos 4t \\
 & \quad + 34''.30 \cos (2t - x) + 0''.37 \cos (4t - 2x) \\
 & - 0''.40 \cos z + 1''.92 \cos (2t - z) + 1''.45 \cos (2t - x - z) \\
 & + 1''.16 \cos (x - z) - 0''.71 \cos (2y - x) - 0''.95 \cos (x + z) \\
 & + 0''.01 \cos (x - t) - 0''.31 \cos (2x - 2t) \\
 & - 0''.31 \cos (2t + z) - 0.23 \cos (2t - x + z) \\
 & - 0''.11 \cos (2y - 2t) + 0''.22 \cos (2t + x - z) - 0''.12 \cos (3x - 2t) \\
 & + 0''.14 \cos (t + z) + 3''.09 \cos (2t + x) + 0''.60 \cos (4t - x) \\
 & - 0''.11 \cos (t + x) + 0''.28 \cos (2t + 2x) \\
 & + 0''.12 \cos (2x - z) - 0''.10 \cos (2x + z) + 0''.09 \cos (2t - 2z) \\
 & - 0''.09 \cos (2y + x - 2t) + 0''.05 \cos (2t - x - 2z) \\
 & + 0''.06 \cos (4t - x - z).
 \end{aligned}$$

Also, the correction to be applied to the equatoreal horizontal parallax found from Burckhardt's tables is

$$\begin{aligned}
 & 1''.79 + 0''.13 \cos x + 0''.06 \cos 2x + 0''.14 \cos 3x + 0''.04 \cos 4x \\
 & + 0''.06 \cos t + 0''.05 \cos 2t - 0''.29 \cos 3t + 0''.17 \cos 4t \\
 & \quad - 0''.18 \cos (2t - x) + 0''.01 \cos (4t - 2x) \\
 & + 0''.05 \cos z + 0''.93 \cos (2t - z) + 1''.15 \cos (2t - x - z) \\
 & + 0''.07 \cos (x - z) - 1.50 \cos (2y - x) \\
 & - 0''.05 \cos (x - t) + 0''.02 \cos (2x - 2t) \\
 & - 0''.90 \cos (2t + z) - 1''.17 \cos (2t - x + z) \\
 & - 0''.12 \cos (2y - 2t) + 0''.12 \cos (2t + x - z) + 0''.10 \cos (3x - 2t) \\
 & + 0''.14 \cos (t + z) + 0''.09 \cos (2t - 2z) - 0''.06 \cos (2y + x - 2t) \\
 & + 0''.05 \cos (2t - x - 2z) + 0''.07 \cos (2x + z - 2t) \\
 & - 0''.09 \cos (2t + x - 2y)
 \end{aligned}$$

In both the above formulæ, quantities less than $0''.05$ have been neglected, except where they can be included in the same table with larger terms.

When Burckhardt's parallax is known, it will be sufficient for ordinary purposes to calculate the correction to be applied to it, taking into account only the constant term, and the periodic terms depending on the arguments,

$$x, t, 2t-x, 2t-z, 2t+z, 2t-x-z, 2t-x+z, 2y-x, t+z.$$

If extreme accuracy be required, the parallax should be calculated afresh by means of the first of the above formulæ.

These formulæ, as well as my tables in the Supplement to the *Nautical Almanac for 1856*, give the value of the *sine* of the parallax, converted into seconds of arc, which is frequently more convenient for use than the parallax itself.

To find this latter quantity, we must add

$$0''.16 + 0''.03 \cos x.$$

Plana's formula for the parallax, as given in the Introduction to the Greenwich Lunar Reductions, also requires several corrections, partly in consequence of the developements not having been carried far enough, and partly from errors in the numerical conversion of the analytical expression.

The constant of parallax employed in the Lunar Reductions appears to be Henderson's, or $3421''.8$; and the computed quantity is taken to be the parallax itself.

The correction to be applied to the parallax thus found, in order to make it agree with my determination, is given by the following formula :—

$$\begin{aligned} & 0''.68 - 0''.16 \cos x - 0''.13 \cos 2x + 0''.03 \cos 3x + 0''.04 \cos 4x \\ & - 0''.05 \cos t + 0''.63 \cos 2t + 0''.16 \cos 4t \\ & + 0''.40 \cos (2t-x) + 0''.07 \cos (4t-2x) \\ & - 0''.28 \cos (2t-z) - 1''.91 \cos (2y-x) + 0''.29 \cos (2t+z) \\ & + 0''.01 \cos (x-t) - 0''.51 \cos (2x-2t) \\ & + 0''.09 \cos (2y-2t) + 0''.14 \cos (t+z) + 0''.10 \cos (4t-x) \\ & - 0''.11 \cos (t+x) - 0''.02 \cos (2t+2x) \\ & + 0''.12 \cos (2x-z) - 0''.10 \cos (2x+z) + 0''.09 \cos (2t-2z) \\ & - 0''.09 \cos (2y+x-2t) + 0''.05 \cos (2t-x-2z) \\ & + 0''.06 \cos (4t-x-z) \end{aligned}$$

As before, quantities less than $0''.05$ have been neglected, except when they unite with larger terms.

In the *American Nautical Almanac for 1855*, recently published, Plana's formula for the parallax appears to have been employed; the constant, however, being slightly altered.

The following table, which Mr. Farley has obligingly calculated at my request, shows the corrections to be applied to the parallaxes given in this work, in order to make them agree with those found from my tables.

*Differences of Moon's Hor. Par. as given in the American N. A.
from that obtained from Mr. Adams' Tables.*

1855. G. M. Noon of each Day.

Day of Mth.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	-1'5"	-3'1"	-2'2"	-0'6"	+0'8"	+1'6"	+1'4"	-0'2"	-2'3"	-2'6"	-3'3"	-1'3"
2	1'7	3'4	2'2	0'6	0'8	1'2	0'9	1'1	2'9	2'9	3'3	0'9
3	2'4	3'4	2'2	0'8	0'4	0'8	+0'2	1'9	3'6	3'2	3'1	-0'5
4	2'9	3'9	2'6	1'0	+0'2	0'3	-0'5	2'6	3'9	3'7	2'4	+0'1
5	3'3	4'0	2'8	1'2	0'0	+0'1	1'0	3'0	4'1	3'5	1'7	0'5
6	3'5	3'8	2'7	1'1	-0'2	-0'1	1'6	3'6	4'0	3'3	1'1	0'7
7	3'6	3'3	2'5	0'8	+0'2	0'2	1'8	3'8	3'8	2'8	-0'4	1'4
8	3'3	2'6	2'2	-0'2	0'5	0'4	2'1	3'8	3'3	2'0	+0'5	2'1
9	3'3	2'0	1'8	+0'5	0'8	0'6	2'4	3'8	2'8	1'2	1'0	2'2
10	3'0	1'5	1'1	1'1	0'8	0'7	2'5	3'4	2'3	-0'4	1'5	2'2
11	2'5	1'2	-0'4	1'3	0'7	0'9	2'5	3'1	1'8	+0'4	1'6	1'5
12	2'2	0'8	0'0	1'3	0'6	1'2	2'5	3'0	1'2	0'7	1'4	+0'6
13	1'8	-0'2	+0'4	1'4	0'5	1'5	2'6	2'7	0'6	0'8	0'8	-0'5
14	1'2	+0'4	0'8	1'2	+0'3	2'0	2'9	2'4	-0'2	0'9	+0'3	0'8
15	-0'4	1'1	1'2	1'2	0'0	2'4	2'9	2'0	+0'1	0'9	-0'2	1'1
16	+0'5	1'7	1'3	0'8	-0'6	2'7	3'0	1'7	0'3	0'8	0'6	1'7
17	1'1	1'8	1'5	+0'4	1'2	3'0	2'9	1'3	0'5	0'7	0'9	2'1
18	1'3	1'2	1'6	-0'3	1'9	3'0	2'6	0'8	0'5	0'4	1'4	2'3
19	1'2	+0'5	0'9	1'0	2'5	3'0	2'0	0'4	0'4	+0'1	1'7	2'6
20	0'7	-0'4	+0'5	1'9	2'8	2'7	1'8	0'4	0'1	-0'5	2'2	3'0
21	+0'1	1'2	-0'4	2'4	2'8	2'4	1'5	0'0	+0'1	1'0	2'4	3'1
22	-0'4	1'9	1'2	2'7	2'7	2'1	0'9	-0'1	-0'2	1'4	2'3	2'5
23	1'0	2'4	1'8	2'7	2'3	1'5	0'4	+0'3	0'1	1'3	2'2	2'0
24	1'3	2'8	1'9	2'5	2'0	1'0	-0'1	0'6	0'0	1'3	1'7	1'5
25	1'5	2'8	2'1	2'2	1'6	-0'2	+0'4	0'9	0'0	1'0	1'3	1'4
26	1'7	2'7	2'5	1'8	1'1	+0'6	1'1	1'3	0'1	1'1	0'8	1'2
27	1'8	2'5	2'5	1'2	-0'3	1'0	1'8	1'3	0'5	1'3	0'9	0'6
28	2'2	-2'5	2'1	0'7	+0'5	1'9	1'9	+0'7	0'9	1'5	1'3	0'9
29	2'3	...	1'7	-0'1	1'5	2'4	2'1	0'0	1'4	1'7	1'2	-0'5
30	2'6	...	1'4	+0'4	1'9	+2'1	1'6	-0'7	-1'9	2'4	-1'4	0'0
31	-2'8	...	-1'1	...	+1'9	...	+0'7	-1'6	...	-2'7	...	+0'8

The constant employed in the computations of the American *Nautical Almanac* does not appear to be mentioned in the Preface. It may, however, be determined in the following manner:—

The sum of the daily corrections given in the above table is $-370''\cdot4$. Now, I find that $-14''\cdot1$ of this is due to the corrections applied to the periodic terms, leaving $-356''\cdot3$ as the effect caused

by the difference of the constants. This, divided by 365, gives $-0''.98$ as the correction to be applied to the constant of the *American Nautical Almanac*, in order to make it agree with my own. Hence, this latter value being $3422''.32$, it follows that the constant employed in the above work is $3423''.30$.

Report of the Astronomer Royal to the Board of Visitors. Read at the Annual Visitation of the Royal Observatory, Greenwich, 1853, June 4.

In this Report the Astronomer Royal exhibits the state of the Observatory on 1853, May 22, and records generally the principal occurrences from 1852, May 18, to 1853, May 22.

Under the head of *Grounds and Buildings*, an account is given of the progress of operations for forming a galvanic communication between the Observatory and other places of importance, both in this country and on the Continent. The communication with the various parts of the British Isles is maintained by means of wires passing from the Observatory to the South Eastern Railway Terminus at London Bridge. With respect to the Continent, this is effected by forming a connexion between the Observatory and the wires of the Submarine Telegraph Company, which pass underground from London to Dover. One of the Company's wires was cut where it crosses Blackheath, and the interrupted segments were continued by branches to a turn-plate, which is contained in an iron box fixed in the south wall of the Park. From this turn-plate a wire is led into the transit circle-room of the Royal Observatory. By different adjustments of the turn-plate, communications are made between London and Paris, between London and Greenwich, or between Greenwich and Paris. This part of the Report concludes with the statement that the Observatory now possesses the means of communicating with every part of Great Britain and of the Continent.

The Moveable Property, the Manuscripts, and the Library of the Observatory, are next noticed in succession. With respect to the Manuscripts, it is stated that Professor De Morgan has recently transmitted to the Observatory a considerable number of letters found in the collection of correspondence of the late Mr. Baily. These letters are, doubtless, calculated to throw much valuable light upon the scientific history of the age in which Mr. Baily lived; and on this account they cannot fail to be hereafter consulted with advantage.

Astronomical Instruments.—The condition of the various instruments is noticed under this head, and appears to be satisfactory. With respect to the recording of transits by the aid of galvanism, the following statement is made:—"The Barrel Apparatus for the American method of observing transits is not yet brought into use. In an apparatus, embodying much that is new (for the